Inflammation (© 2018)
DOI: 10.1007/s10753-018-0738-2

ORIGINAL ARTICLE

# Effects of Diet-Induced Obesity on Tracheal Responsiveness to Methacholine, Tracheal Visfatin Level, and Lung Histological Changes in Ovalbumin-Sensitized Female Wistar Rats

**Rana Keyhanmanesh,[1] Mohammad Reza Alipour,[2] Hadi Ebrahimi,[1] and Mohammad Reza Aslani[3,4]**

*Abstract*— Many studies have shown a close relationship between obesity and asthma severity. In the present study, the effects of diet-induced obesity were examined on airway responsiveness to methacholine in addition to visfatin level in female Wistar rats' trachease after sensitization with ovalbumin. The rats were divided into four groups: control with normal diet (ND), ovalbumin (OVA)-sensitized with normal diet (S + ND), high-fat diet (HFD), and OVA-sensitized with a high-fat diet (S + HFD). The animals were fed for 8 weeks with standard pelts or high-fat diet and then sensitized and challenged with OVA or saline for another 4 weeks. At the end of the study, the trachease were isolated and assessed for airway responsiveness and visfatin protein levels. Diet-induced obesity groups developed increased weight and obesity indices ($p < 0.001$). After sensitization with OVA and diet-induced obesity, there were marked leftward shifts in methacholine concentration-response curves in S + HFD group compared to other groups. Also, maximum response was the highest ($p < 0.05$ to $p < 0.001$), $EC_{50}$ was the lowest ($p < 0.05$ to $p < 0.001$), and visfatin protein level was the highest ($p < 0.05$ to $p < 0.01$) in S + HFD. According to results, diet-induced obesity caused airway hyperresponsiveness to methacholine and enhanced visfatin protein levels in the trachease of ovalbumin-sensitized female rats. Our results suggested that, in obese ovalbumin-sensitized conditions in female rats, the local production of adipocytokines, such as visfatin, may be increased, resulting in the deterioration of inflammation in lungs. This finding shows a possible mechanism for the altered phenotype in obesity-ovalbumin sensitization conditions in female rats.

**KEY WORDS:** airway hyperresponsiveness; asthma; obesity; visfatin; female Wistar rats.

## INTRODUCTION

Numerous epidemiological studies have shown the role of obesity in the increased prevalence and incidence of asthma in adults and children [1] as well as the deterioration of asthma control [2]. Accordingly, data obtained from animal models support the association between obesity and asthma [3]. Airway inflammation along with airway hyperresponsiveness (AHR) is the main characteristics of bronchial asthma [4]. However, the effects of

[1] Drug Applied Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
[2] Tuberculosis and Lung Diseases Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
[3] Ardabil Imam Khomeini Educational and Clinical Hospital, Ardabil University of Medical Sciences, Ardabil, Iran
[4] To whom correspondence should be addressed at Ardabil Imam Khomeini Educational and Clinical Hospital, Ardabil University of Medical Sciences, Ardabil, Iran. E-mail: mr_aslani@hotmail.com



Published online: 29 January 2018